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AUTHOR Pascarella, Ernest T.; Terenzini, Patrick T.
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ABSTRACT

This exploratory study was designed to determine whether those students enrolled in courses systematically designed by faculty teams to incorporate nontraditional and innovative instruction differed from students not taking these courses in attitudes toward academic and nonacademic experience. Questionnaires were sent to a sample of 400 freshman students; data are based on the 379 replies received. Stepwise discriminant analysis indicated that two factor dimensions, interest value and practical appeal, were rated more positively by students in systematically designed courses than by other students. Findings suggested that systematic instructional development efforts may have positive impacts beyond the course level. Statistical data tables are included in the report, and references are attached. (Author/KP)

RATINGS OF THE ACADEMIC PROGRAM BY FRESHMAN STUDENTS IN "SYSTEMATICALLY DESIGNED" AND "CONVENTIONAL" COURSES: A DISCRIMINANT ANALYSIS

by

Ernest T. Pascarella
Center for Instructional Development
Syracuse University
115 College Place
Syracuse, N.Y. 13210

and

Patrick T. Terenzini
Office of Student Affairs
Syracuse University
Syracuse, N.Y. 13210

ABSTRACT

The purpose of this exploratory study was to determine whether freshman students enrolled in two or more of seven courses which had been systematically designed by faculty teams differed from students not taking these courses in their attitudes toward their academic and non-academic experience. A stepwise discriminant analysis indicated that two factor dimensions, termed Interest Value and Practical Appeal, best distinguished between the two samples. Freshmen taking two or more "systematically designed" courses rated their academic program in a significantly more positive direction on both dimensions than did students not enrolled in these courses. The findings suggest systematic instructional development efforts may have positive impacts beyond the course level.

The literature on experimental, innovative and non-traditional instruction in higher education has grown rapidly since the mid-1960's. One need only glance at the studies reviewed by Trent and Cohen (1973) to appreciate this proliferation. One level of research in this area has dealt with student responses to very specific instructional technologies (e.g., television and computer-assisted instruction) or instructional systems, e.g., the auto-tutorial system (Postelthwait, Novak and Murray, 1964) and the "Keller Plan" or Personalized System of Instruction (Keller, 1968).

For example, Mathis, Smith and Hansen (1970) found that students had generally favorable attitudes toward computer-assisted instruction before experiencing it and that these positive attitudes remained essentially unchanged subsequent to being exposed to it. Davis, Johnson and Dietrich (1969), Deeming (1966) and Menne, Hannum, Klingensmith and Nord (1969) all report positive student attitudes toward televised lectures, although significant increases in achievement are not so clearly substantiated. Trent and Cohen (1973) in reviewing a comprehensive study of multimedia auto-tutorial techniques on engineering students by Trent (1970) suggest a trend toward positive relationships between multimedia instruction and performance on media-related examination tasks, and between multimedia instruction and attitudes toward course experiences.

The evaluative research conducted on the Personalized System of Instruction, or the "Keller Plan," is perhaps the most extensive of all. Green (1970), Riner (1972), Roth (1973) and Smith, Grey and McCauley (1973) all report generally positive student attitudes toward exam-tutorials and self-pacing aspects of the Personalized System of Instruction. Roth and Smith, Grey and McCauley also report higher scores on measures of course achievement by students taking engineering courses under the "Keller Plan" than by students taking the same courses offered in a conventional format. A comprehensive review of research on the Personalized System of Instruction has been published by Kulik, Kulik and Carmichael (1974). They conclude that, in terms of both student achievement and student attitudes toward,

instruction, the Personalized System of Instruction is always the equivalent and, in many cases, a significant improvement over conventional methods.

A second level of research in this area has focused on the evaluation of curricular or instructional experiments involving entire institutions (e.g., Gaff, 1970; Morgan, 1972) or major units within an institution larger than a department (e.g., Siebel, 1973; Stakenas, 1972). Although the results of these evaluations have been generally favorable in terms of measured impact and students' attitudes toward their total educational experience, the organizational obstacles to broadly conceived instructional change in many institutions are pervasive and often prohibitive (Hefferlin, 1969). This may be particularly true when inter-departmental cooperation is required (Mayhew and Ford, 1971). Thus, while institution-wide program innovations may have more extensive impacts than instructional innovations directed at the course level, the former may also be substantially more difficult to bring about than the latter.

Much of the literature cited above deals effectively with student attitudes toward broadly implemented curricular innovations or with student responses to individual courses or units of experimental/non-traditional instruction. Little research, however, appears to have focused on the relationship between exposure to experimental/non-traditional instruction at the course level and student attitudes toward more global aspects of college such as the quality of the academic program in general.

The purpose of this study was to determine whether freshman students enrolled in courses which had been systematically designed by faculty teams working with an on-campus instructional development center differed from students not taking these courses in ratings of their academic program, ratings of their non-academic life, amount of informal interaction with faculty and degree of involvement in extracurricular programs. The importance of such research is twofold. First, it is aimed at determining the extent to which systematically designed instructional efforts may have impact beyond the course level; and second, it explores the

potential impact derived from establishing units which institutionalize those efforts.

METHODOLOGY

Sample

The setting for the study was Syracuse University, a large, private university with a total undergraduate enrollment of approximately 10,000 students located in Central New York State. A simple random sample of 500 freshmen was drawn by computer from the population of freshmen enrolled in the College of Arts and Sciences at that institution. The Arts and Science population from which the sample was drawn was approximately 54% male and 46% female, as estimated at the beginning of the spring 1975 semester.

Instrument

As a measure of their ratings of their academic program, students were asked to rate the statement "I HAVE FOUND MY ACADEMIC PROGRAM AT S.U. TO BE:" on the Adjective Rating Scale (ARS). (Kelly and Greco, 1975). The ARS was also used by the student sample to respond to the statement "I HAVE FOUND MY NON-ACADEMIC LIFE AT S.U. TO BE:" The ARS consists of twenty-four adjectives (e.g., good, enjoyable, demanding, boring, useless, practical, different, interesting, dull) against which the respondent rates certain specific statements using the following four-point scale: 1 = extremely, 2 = very, 3 = somewhat, 4 = not at all. The adjectives initially selected in the development of the instrument were chosen from descriptors typically employed by students to rate the instruction received in individual undergraduate courses. A series of factor analytic studies using different methods of factor analysis indicated a stable underlying solution consisting of five factors. Subsequent validational analysis indicated substantial correlations (r = .58 to .93 in magnitude) among the five factors of the ARS and the evaluation, potency and activity dimensions of the Semantic Differential (Kelly and Greco, 1975).

Additional items on the instrument asked students to estimate both

the number of times during the semester they had met informally with faculty members for ten minutes or more and the approximate number of extracurricular activities in which they had participated during the year. The questionnaire also asked students to respond to a number of other items, such as expected major, sources of personal satisfaction and influence, educational goals and "Clark-Trow" typology which were a supplementary part of the present analysis. The four educational goals which students ranked in terms of their importance were: 1) basic general education and appreciation of ideas, 2) knowledge and skills directly applicable to a career, 3) increased knowledge of self, values and goals, and 4) the enhancement of interpersonal skills. The Clark-Trow typology, based on students' orientations toward ideas and their identification with the institution, presented respondents with four statements (labeled w, x, y and z) describing different kinds of students and asked them to select the one which most closely described themselves. The four statements represented Clark-Trow's "Vocational," "Collegiate," "Academic" and "Non-Conformist" types and were drawn from Gottlieb and Hodgkins (1968). Slight modifications were made in the original statements to eliminate references to gender.

In order to separate freshmen who took systematically designed courses from those who did not, students were asked to indicate whether they had taken, or were presently enrolled in, any of seven large undergraduate courses which had been developed by faculty teams working in collaboration with an on-campus instructional development unit. The development of each course required from six to twelve months before the initial field testing. This typically included a four- to eight-week intensive summer period in which the faculty team was paid full time to work with a professional developer in the design and preparation of the course for the academic year. A more detailed description of the general process followed in the development of each course is found in Diamond, et al. (1975).

The predominant instructional aspects of each of the seven courses are listed briefly below. While most of the courses have distinctive instructional features which could be termed non-traditional, innovative or personalized, it was felt that the term "systematically designed" was the most appropriate general descriptor for each.

1. Communications and Society: This large enrollment, basic communications course employed a variety of teaching/learning strategies such as lectures, discussion sections, private tutorial help and a number of self-instructional materials. Additional features were telephone discussions by nationally recognized experts and a series of optional evening enrichment activities.
2. Drugs in Perspective: This interdisciplinary course presented a broad view of drugs and drug education in American culture. It utilized a wide variety of self-instructional materials, simulations, and small-group activities. A variety of optional extra credit minicourses allowed students to earn from 3-6 academic credits.
3. Foundations of Human Behavior: Based on the "Keller Plan," this was a three-credit undergraduate survey course which featured self-instructional materials and permitted students to cover the course content essentially at their own pace. Students moved from one unit to the next only after demonstrating sufficient content mastery on a unit test.
4. International Relations: This course offered students a variety of content options as well as a variety of learning activities which could be used to satisfy the instructional objectives of the course. These included computer simulation, role playing games, and video taping. A series of optional minicourses allowed students to earn from 3-6 credits.
5. Introduction to the Study of Religion: Students in this course

took a two-week introductory sequence which was followed by a wide range of options such as "Myth," "God and Reason," and "Psychological Approaches to the Study of Religion." Students were required to select three of the available options to obtain three credits and then could take additional options or available minicourses to earn from 1-3 additional credits.

6. Self-Paced Calculus: Like Foundations of Human Behavior this course was an adaptation of the "Keller Plan." By using detailed study guides, programmed instruction sequences, and available tutorial help, students could cover the course material essentially at their own pace. An additional feature built into the course was flexible credit. Depending on how quickly a student mastered each unit of material he or she could earn from 2-6 credits during the semester.
7. Introductory Sociology: This was a flexible credit course which allowed students to earn from 3-6 credits during the semester. The course presented the basic theories, concepts and methods of Sociology in a format which allowed a variety of content and methodology options and a choice from among alternative projects to satisfy course requirements.

Students were classified in the "systematic design" group if they had taken, or were currently enrolled in, two or more of the seven courses. Those respondents who indicated that they had not taken, or were not presently enrolled in, any of the seven courses were classified as a "conventional" group. (It should be noted that the word "conventional" in the present study is intended only for classification purposes. Clearly it may not be the most appropriate term for all the courses to which students in the conventional group have been exposed.)

Response

The questionnaire was distributed by mail to the entire sample in late March of 1975. Subsequent to a mail follow-up conducted on a random sample

of non-respondents approximately three weeks after the initial mailing, usable responses were obtained from 379 subjects, yielding a response rate of 75.8%. The representativeness of the sample was indicated by two factors: the high rate of response to the questionnaire, and a chi-square analysis indicating non-significant differences between the distribution of responding males and females and the distribution of males and females in the population.

Forty-six respondents indicated that they had taken two or more of the specified courses and thus constituted the systematic design group. One-hundred twenty-seven respondents had not taken any of the seven courses. These individuals formed the conventional group. From this latter group, 46 subjects were randomly selected to give equal N's in both comparison groups and to permit later use of the remaining 81 subjects in the conventional group for cross-validation purposes.

To check for representativeness, a second independent random sample of 46 subjects was chosen from the conventional group and compared to the first sample from the conventional group all variables used in later analysis. Each of the mean differences noted had significance levels greater than .20 and thus could be reasonably attributed to chance. Furthermore, a chi-square analysis could not reject the null hypothesis of chance differences between the distribution of males and females in the total conventional group of 127 and the distribution of males and females in the initial subsample of 46 from the conventional group.

The observed differences between the systematic design and conventional sample groups on 1) the distribution of respondents by sex, expected major and Clark-Trow typology choice; 2) the rank-ordering of the four educational goal statements; and 3) the means of available Scholastic Aptitude Test scores were tested for significance. (It should be noted that in the latter analysis SAT scores were available for 32 respondents in the systematic design group and 35 respondents in the conventional group). The chi-square values obtained for the distribution of respondents by sex, expected major and Clark-Trow typology choice were: 0.39 (df = 1), 4.48 (df = 4) and 3.88 (df = 3), respectively. None of the three chi-square values was

significant at $p < .50$. Similarly, the Mann-Whitney test for the equality of means in rank-ordered data (Siegel, 1956) indicated non-significant differences between the two groups in the mean ranking of all four educational goal statements. Finally, t-tests indicated non-significant differences between the systematic design and conventional groups on the Verbal and Quantitative scores of the SAT. The means and standard deviations for the Verbal score were: systematic design: $\bar{x} = 512$, S.D. = 99.77; conventional: $\bar{x} = 520$, S.D. = 101.89; ($t = 0.31$). The corresponding values for the Quantitative score were systematic design: $\bar{x} = 544$, S.D. = 104.6; conventional: $\bar{x} = 539$, S.D. = 92.51; ($t = 0.20$). As the above set of analyses indicates, the two sample groups were essentially homogeneous on all variables tested.

Statistical Analysis

Although the factor structure of the Adjective Rating Scale was previously developed on a sample of 769 subjects, the stimulus statement to which the subjects responded pertained to specific courses (Kelly and Greco, 1975). In the present study students were being asked to rate somewhat broader experiences, i.e., the academic program and their non-academic life. It was, therefore, judged necessary to empirically determine the factor structure which held for this somewhat different use of the ARS and verify the degree of structural similarity with the original solution reported by Kelly and Greco, (1975).

Analysis of the data thus began with a principal components analysis of subjects' ARS responses. A separate analysis was done for each of the two statements rated. Following Kaiser's (1959) varimax criterion, components with eigenvalues ≥ 1.0 were extracted and subjected to varimax rotation to orthogonality. The rotated components will hereafter be referred to as factors. "Program Relate" (Veldman, 1967) was used to compare the structural similarity of the original solution reported by Kelly and Greco (1975) and the factor solution yielded by the use of the ARS in the present study. "Program Relate" permits the comparison of factor structures from two independent sample groups by holding one structure

fixed and rotating the second structure on it until maximal similarity is achieved among the individual test vectors (test vectors in the present study are the 24 adjective scales). The degree of rotation required to achieve maximal similarity is expressed as a matrix of cosines, which may be regarded as a matrix of correlations between the two sets of factor vectors.

Mean factor scales were computed for each respondent by summing his raw scores on variables with rotated factor loadings of .40 and above on a particular factor and dividing by the number of variables. Where a variable loaded above .40 on two dimensions it was included in the computation of factor scales for that factor on which it had the higher loading. The purpose of computing factor scales by using characteristic variables rather than a complete estimation method in which all variables, regardless of their factor loadings, are used was to increase the internal consistency (alpha) reliability of the individual factor scales (Armor, 1974). At the same time, using only those variables with high loadings to compute factor scales may result in the loss of orthogonality and lead to substantial inter-scale correlations. The authors judged that it would be preferable to optimize the internal consistency reliability of each scale despite the potential loss of orthogonality since the latter situation can be dealt with effectively by employing multivariate procedures, specifically discriminant analysis.

The factor scales derived from respondents' ratings of their academic program and their non-academic life were combined with their number of informal interactions with faculty and their participation in extracurricular activities. These variables formed the basis of a two-group discriminant function analysis (Cooley and Lohnes, 1971) to determine the effectiveness with which they separated the systematic design from the conventional group. The academic and non-academic variables were employed as predictor variables and entered into the discriminant analysis in a stepwise fashion. The criterion for controlling the stepwise selection of variables for inclusion in the analysis was the minimization of Wilk's Lambda. The minimum F-ratio to enter the analysis was set at 1.0. Subsequent to discriminant analysis, a classification analysis based on the pooled covariance

matrix and individual discriminant scores was used to assess the efficacy of the discriminant function obtained. In order to cross-validate the discriminant analysis, classification was performed both for the 92 subjects on whose scores the discriminant function was derived, and for the remaining 81 subjects from the conventional sample whose scores were not included in the computation of the discriminant function. Computer programs employed in the analysis were "Subprogram Factor" and "Subprogram Discriminant" from the Statistical Package for the Social Sciences, Second Edition (NIE, et al, 1975), and "Program Relate" (Veldman, 1967).

RESULTS

Factor analysis of students' ARS ratings of their academic program and their ARS ratings of their non-academic life yielded five factors and four factors respectively with eigenvalues ≥ 1.0. The composition of these two sets of factors is shown in Tables 1 and 2. Asterisked loadings indicate those variables on each factor used to compute factor scales. Each factor has been given a tentative name which was felt to represent the underlying psychological construct tapped. The reader is cautioned, however, against attributing surplus meaning to the factors beyond the scales which characterize them.

Tables 1 and 2 also show the alpha or internal consistency realibility coefficients computed for each set of factor scales. As shown in Table 1, scales for Factor V, Uniqueness, had a computed internal consistency reliability of only .274. This dimension was therefore not included in further analysis. Similarly, Factor IV, unnamed in Table 2, was not included in further analysis because it was judged to be uninterpretable within the context of the statement rated.

The results of "Program Relate" indicated a high degree of structural similarity between the original Kelly and Greco (1975) factor solution and the two solutions yielded in the present study. Cosines between the original ARS factors and those derived from the present samples' ARS

TABLE 1

VARIMAX FACTOR LOADINGS DERIVED FROM SUBJECTS' ADJECTIVE RATING SCALE RESPONSES TO THE STATEMENT "I HAVE FOUND MY ACADEMIC PROGRAM TO BE:" (N=379)

VARIABLE	I INTEREST VALUE	II DULLNESS/ APATHY	III PRACTICAL APPEAL	IV DIFFICULTY/ CHALLENGE	V UNIQUENESS	h^2
ENJOYABLE	.778*	-.120	.133	-.010	.177	.669
EXCITING	.756*	-.102	.184	.065	.240	.677
STIMULATING	.738*	-.212	.112	.039	.078	.609
ENLIGHTENING	.706*	-.102	.216	.172	.153	.608
INTERESTING	.668*	-.369	.104	.204	-.137	.654
REWARDING	.660*	-.214	.368	.042	.027	.627
GOOD	.615*	-.264	.214	.232	-.056	.551
PROVOCATIVE	.584*	-.010	.194	.063	.061	.396
INFORMATIVE	.535*	-.293	.264	.265	-.136	.530
IRRELEVANT	-.005	.753*	-.310	-.008	-.103	.673
DULL	-.393	.706*	.003	.072	-.062	.661
BORING	-.412	.658*	.039	-.067	.090	.617
USELESS	-.209	.647*	-.418	.019	-.151	.660
A WASTE	-.239	.623*	-.375	-.060	-.205	.632
NECESSARY	.159	-.084	.739*	.105	.145	.610
PRACTICAL	.352	-.179	.602*	.015	.076	.524
VALUABLE	.512	-.281	.583*	.148	-.067	.707
WORTHWHILE	.498	-.374	.513*	.068	-.053	.658
RELEVANT	.322	-.398	.442*	.124	-.135	.491
DEMANDING	.094	-.024	.069	.855*	.125	.761
DIFFICULT	.054	.111	-.025	.852*	-.027	.743
CHALLENGING	.318	-.218	.267	.687*	.137	.711
GENERAL	-.025	.386	.011	-.078	-.695*	.640
DIFFERENT	.353	-.162	.202	.154	.549*	.518
EIGENVALUES (pre-rotated)	9.229	2.100	1.527	1.070	1.005	
EIGENVALUES (rotated)	5.534	3.374	2.650	2.233	1.123	
% VARIANCE	23.08	14.06	11.01	9.33	4.67	
CUM. VARIANCE	23.08	37.14	48.15	57.48	62.15	
ALPHA RELIABILITY	0.898	0.852	0.817	0.778	0.274	

NOTE: 1. VARIANCE PERCENTAGES ARE ROTATED FIGURES.

2. ASTERISKED LOADINGS INDICATE VARIABLES USED TO COMPUTE FACTOR SCALES AND ALPHA RELIABILITY COEFFICIENTS FOR EACH SCALE.

TABLE 2

VARIMAX FACTOR LOADINGS DERIVED FROM SUBJECTS' ADJECTIVE RATING SCALE RESPONSES TO THE STATEMENT "I HAVE FOUND MY NON-ACADEMIC LIFE TO BE:" (N=379)

VARIABLE	I INTEREST VALUE	II DEMAND/ CHALLENGE	III PRACTICAL APPEAL	IV UNNAMED	h^2
EXCITING	.836*	.146	.154	.001	.745
ENJOYABLE	.814*	-.052	.264	-.030	.735
GOOD	.783*	.043	.311	-.083	.718
INTERESTING	.717*	.073	.318	-.004	.621
STIMULATING	.709*	.141	.379	-.049	.668
REWARDING	.706*	.213	.345	.171	.691
ENLIGHTENING	.666*	.168	.290	.139	.576
BORING	-.633*	.173	-.194	.319	.571
WORTHWHILE	.605*	.179	.531	.074	.685
DULL	-.601*	.097	-.329	.373	.619
VALUABLE	.585*	.189	.556	.085	.694
PROVOCATIVE	.565*	.207	.240	.135	.438
DEMANDING	.128	.779*	.088	-.128	.648
CHALLENGING	.215	.745*	.181	-.020	.635
DIFFICULT	-.279	.735*	-.108	.106	.641
DIFFERENT	.294	.418*	.149	-.060	.287
IRRELEVANT	-.238	.037	-.724*	.237	.638
USELESS	-.268	-.003	-.713*	.300	.670
A WASTE	-.275	.002	-.696*	.279	.639
RELEVANT	.375	.122	.628*	.235	.604
PRACTICAL	.264	.167	.544*	.209	.438
INFORMATIVE	.391	.231	.544*	.290	.586
NECESSARY	.353	.211	.487*	.213	.452
GENERAL	.029	-.133	-.015	.698	.507
EIGENVALUES (pre-rotated)	9.969	2.113	1.278	1.147	
EIGENVALUES (rotated)	6.645	2.311	4.248	1.299	
% VARIANCE	27.66	9.60	17.70	5.45	
CUM. VARIANCE	27.66	37.20	54.90	60.35	
ALPHA RELIABILITY	0.941	0.694	0.836		

NOTE: 1. VARIANCE PERCENTAGES ARE ROTATED FIGURES.

2. ASTERISKED LOADINGS INDICATE VARIABLES USED TO COMPUTE FACTOR SCALES AND ALPHA RELIABILITY COEFFICIENTS FOR EACH SCALE.

ratings of their academic program ranged form .87 to .98. Similar congruence was indicated between the original factors and students' ARS ratings of their non-academic life. The cosines ranged from .70 to .95.

The matrix of intercorrelations among the nine predictor variables is shown in Table 3. Table 4 displays the means, standard deviations and univariate F-ratios for each of the predictor variables. Significant univariate F-ratios were found on two factors from students" ARS ratings of the academic program, Interest Value and Practical Appeal. The systematic design group rated the academic program in a significantly more positive direction on both dimensions than did the conventional course group (recall the ARS is scored 1 = extremely, 2 = very, 3 = somewhat, 4 = not at all).

The results of the stepwise discriminant analysis are shown in Table 5. As indicated, 5 variables entered the analysis with an F-ratio to enter > 1.0. The discriminant function based on those 5 variables yielded a chi-square value of 13.79, significant at the .025 level. Inspection of the standardized discriminant function coefficients indicates that three factors derived from students' ARS ratings of the academic program contributed most to the discrimination between the systematic design and conventional groups. The amount of informal interaction with faculty and the Practical Appeal factor from students' ARS ratings of their non-academic life appeared to contribute less to the discrimination than the three academic variables. As indicated by the change in Rao's V, however, only one of the five variables in the analysis, Interest Value (academic program), made a significant increase in the discrimination between the two groups.

The fact that the significant univariate difference between the systematic design and conventional groups on Practical Appeal (academic program) was not reflected by a significant change in Rao's V statistic when Practical Appeal entered the stepwise analysis appears to be explained by the substantial correlation between that variable and Interest Value (academic program), r = .73. Because of the high correlation between the two variables and because Interest Value had already entered the analysis,

TABLE 3

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS AMONG NINE DISCRIMINATING VARIABLES (N=92)

VARIABLE	1	2	3	4	5	6	7	8	9
1. INTEREST VALUE (ACAD. PROG.)	1.00								
2. DULLNESS/APATHY (ACAD. PROG.)	-.55	1.00							
3. PRACTICAL APPEAL (ACAD. PROG.)	.73	-.54	1.00						
4. DIFFICULTY/CHALLENGE (ACAD. PROG.)	.37	-.24	.46	1.00					
5. INTEREST VALUE (NON-ACAD. LIFE)	.33	-.30	.27	.30	1.00				
6. DIFFICULTY/CHALLENGE (NON-ACAD. LIFE)	.06	-.03	.16	.19	.34	1.00			
7. PRACTICAL APPEAL (NON-ACAD. LIFE)	.35	-.28	.37	.31	.74	.27	1.00		
8. INFORMAL INTERACTION WITH FACULTY	-.32	.19	-.23	-.20	-.17	-.08	-.13	1.00	
9. EXTRACURRICULAR ACTIVITIES	-.20	-.05	-.18	-.04	-.02	.05	-.16	.32	1.00

Note: Because the Adjective Rating Scale is scored 1 = extremely, 2 = very, 3 = somewhat, 4 = not at all caution should be observed in interpreting the signs of the correlations between the ARS scales on the one hand and INFORMAL INTERACTION WITH FACULTY and EXTRACURRICULAR ACTIVITIES on the other. For example, the r of +.32 between INTEREST VALUE (ACAD. PROG.) and INFORMAL INTERACTION WITH FACULTY suggests that as the number of informal interactions with faculty increases student ratings on INTEREST VALUE become more positive.

TABLE 4

MEANS, STANDARD DEVIATIONS AND UNIVARIATE F RATIOS FOR NINE DISCRIMINATING VARIABLES

VARIABLE	SYSTEMATIC DESIGN(N=46) MEAN	S.D.	CONVENTIONAL (N=46) MEAN	S.D.	F RATIO[a]
INTEREST VALUE (ACAD. PROG.)	2.53	.560	2.81	.455	7.05**
DULLNESS/APATHY (ACAD. PROG.)	3.33	.501	3.34	.434	0.04
PRACTICAL APPEAL (ACAD. PROG.)	2.38	.565	2.64	.469	6.00*
DIFFICULTY/CHALLENGE (ACAD. PROG.)	2.42	.619	2.52	.642	0.59
INTEREST VALUE (NON-ACAD. LIFE)	2.06	.552	2.07	.573	0.01
DIFFICULTY/CHALLENGE (NON-ACAD. LIFE)	2.85	.586	2.91	.546	0.24
PRACTICAL APPEAL (NON-ACAD. LIFE)	1.80	.480	1.76	.459	0.14
INFORMAL INTERACTION WITH FACULTY	3.46	4.14	4.02	7.66	0.19
EXTRACURRICULAR ACTIVITIES	3.87	7.59	2.17	3.67	1.86

[a]DEGREES OF FREEDOM = 1 AND 90.

*p < .025 **p < .01

TABLE 5

STEPWISE SELECTION OF VARIABLES FOR DISCRIMINANT ANALYSIS (MINIMUM F TO ENTER SET AT 1.0)[a]

STEP	VARIABLE	F TO ENTER	CHANGE IN RAO'S V[b]	WILK'S LAMBDA	APPROXIMATE F FOR TEST OF LAMBDA[c]	STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENT
1.	INTEREST VALUE (ACAD. PROG.)	7.05	7.05**	.927	7.05**	.919
2.	DULLNESS/APATHY (ACAD. PROG.)	2.99	3.18	.897	5.09**	.638
3.	INFORMAL INTERACTION WITH FACULTY	1.57	1.79	.881	3.94*	.368
4.	PRACTICAL APPEAL (ACAD. PROG.)	1.30	1.52	.869	3.29*	.605
5.	PRACTICAL APPEAL (NON-ACAD. LIFE)	1.49	1.79	.854	2.94*	-.390
	(PROGRAM TERMINATED DUE TO F TO ENTER <1.0)					

[a]CENTROID FOR SYSTEMATIC DESIGN GROUP = -.432; CENTROID FOR CONVENTIONAL GROUP = .432
CHI SQUARE FOR THE DISCRIMINANT FUNCTION = 13.79 WITH 5 DEGREES OF FREEDOM ($p < .025$)

[b]INDICATES THE INCREASE IN DISCRIMINATION ATTRIBUTABLE TO THAT VARIABLE

[c]DEGREES OF FREEDOM RANGE FROM 1 AND 90 ON STEP 1, TO 5 AND 86 ON STEP 5.

*$p < .025$ **$p < .01$

the inclusion of Practical Appeal did not lead to a significant incremental increase in discrimination between the two groups.

The results of the classification analysis are displayed in Table 6. As the table indicates, 69.56% of the total sample of 92 subjects, on whose scores the discriminant function was derived, were correctly classified. The overall correct classification, including the cross-validation conventional group, was 63.6%. This represented a 27.2% improvement over chance.

A further substantiation of the results is indicated by comparing percentages of respondents in each group who ranked their "academic work" first or second from a choice of six possible areas of campus life as a source of personal satisfaction during their freshman year. In the systematic design group 63% of the students ranked their "academic work" either first or second with 23.9% ranking it first and 39.1% ranking it second. This compared with 43.5% in the conventional group who ranked their "academic work" either first or second as a source of personal satisfaction with only 9.7% ranking it first and 38.3% ranking it second. A Mann-Whitney Test was carried out for the rankings of the two groups on this item. The mean rank for the systematic design group was 2.26 while the mean for the conventional group was 2.73. A z value of 2.03 was obtained, significant at $p < .05$.

Additional Analysis

In order to determine possible differences between the systematic design and conventional groups on personality variables and initial expectations of the college environment, a post-hoc analysis was conducted using the Activities Index-AI, a measure of personality needs, and the College Characteristics Index-CCI, a measure of perceived environmental press. Both instruments are administered to all incoming freshmen shortly before arrival on campus. Thus, students' responses on the College Characteristics Index may be regarded as their expectations of the institution's environment. A separate stepwise discriminant analysis was conducted on the available AI and CCI scale scores of the systematic

TABLE 6

PREDICTED CLASSIFICATION OF "SYSTEMATIC DESIGN" AND "CONVENTIONAL" FRESHMEN

ACTUAL GROUP	PREDICTED SYSTEMATIC DESIGN	PREDICTED CONVENTIONAL	% CORRECT CLASSIFICATION
SYSTEMATIC DESIGN (N=46)	34 (73.9%)	12 (26.1%)	73.9%
CONVENTIONAL (N=46)	16 (34.8%)	30 (65.2%)	65.2%
CROSS-VALIDATION CONVENTIONAL (N=81)	35 (43.2%)	46 (56.8%)	56.8%

NOTE: CORRECT CLASSIFICATION FOR 92 SUBJECTS ON WHOSE SCORES THE DISCRIMINANT FUNCTION WAS COMPUTED = 69.6%

OVERALL CORRECT CLASSIFICATION OF 173 SUBJECTS = 63.6%

design and conventional samples. Data was available for 39 of the systematic design subjects and 38 of the conventional subjects. In neither analysis was the discriminant function significant at $p < .05$ (for the AI comparison chi-square = 6.89 with 3 degrees of freedom, $p > .07$; for the CCI comparison chi-square = 7.04 with 4 degrees of freedom, $p > .10$). Moreover, no univariate F-ratios in either analysis reached significance at $p < .10$.

The students initially participating in the study were followed up during the fall 1975 semester to determine how membership in the systematic design or conventional group was related to attrition from the institution. Thirty-one (24.4%) of the 127 subjects in the conventional group were found to have left the institution. This compared to six (13.0%) of the 46 subjects in the systematic design group. A one-tailed test for the hypothesis of a lower percentage of leavers in the systematic design group had a significance level $.10 > p > .05$. Thus, while the observed difference was in the hypothesized direction, evidence for the reliability of the difference was not particularly strong.

CONCLUSIONS AND DISCUSSION

The findings of this study suggest that students enrolled during their freshman year in two or more systematically designed courses tend to have significantly more positive attitudes toward their overall academic program on two dimensions (termed Interest Value and Practical Appeal) than do freshmen not enrolled in these courses. Because of the substantial correlation between these two dimensions, however, only Interest Value made a significant increase in the discrimination between the systematic design and conventional groups when the variables were entered in a stepwise discriminant analysis. Variables other than students' Adjective Rating Scale views of the academic program failed to distinguish significantly between the two sample groups.

A review of the variables loading high on the Interest Value factor of the ARS suggests that this dimension has both cognitive and affective components. This conclusion is prompted by the high loadings on such cognitive-related adjectives as Enlightening, Interesting, and Informative. An

affective dimension in the Interest Value factor is indicated by the high loadings for such adjectives as Enjoyable, Exciting, and Stimulating. The structure of this factor and the more positive ratings of students, who took two or more systematically designed courses, strongly suggest that these courses have not only a greater attraction for students but also that the attraction is broadly based in terms of the intellectual and emotional make-up of students.

Students in the systematic design group also rated their academic program more positively than did students in the conventional group along the dimension labeled, here, Practical Appeal, a factor which correlated .73 with the Interest Value factor. Practical Appeal loaded high on the following adjectives--Necessary, Practical, and Valuable--and to a lesser degree on Worthwhile and Relevant. One might speculate that this factor reflects the increased interest among students in the utility of an academic program for securing gainful employment following one's college career. But given the high correlation between the Practical Appeal and Interest Value factors, and given the higher scores on these two factors among students enrolled in two or more systematically designed courses when compared with students enrolled in conventional courses, it seems reasonable to conclude that systematically designed courses may lead to an academic program's greater student appeal in three significant areas: cognitive attraction, affective appeal, and perceived utility.

Exactly how such courses might lead students to be more favorably disposed toward their freshman academic experience than conventional courses is more difficult to explain. As indicated earlier, the seven systematically designed courses used as a basis for grouping in this study are widely varied in their design and content. The most evident--and indisputable--commonality of the seven courses is that they were all developed by teams of faculty members working closely with an instructional development agency on the Syracuse University campus. The process, culminating in these seven courses, affords faculty members the time, professional assistance and financial support necessary to effect a rigorous re-evaluation of educational and instructional philosophies, course content and instructional style. It is quite possible that the cumulative effect of this type of support can be associated with measurable differences in broad based instructional or attitudinal outcomes for students. But while such a

result may be intuitively plausible, it cannot be substantiated on the basis of the research reported here.

The results of the study are supportive of institutional efforts in the area of systematic instructional and curricular development and indeed suggest that such efforts may have positive impacts beyond the course level. However, the ex post facto nature of survey research makes the attribution of results difficult because of the myriad of student, faculty and contextual variables which may interact to influence instructional quality and outcomes. Clearly a number of alternative hypotheses may be advanced to explain the study results.

One alternative explanation may be the presence of the "Hawthorne Effect." For a substantial number of freshmen the structure of many of the systematically designed courses may have been sufficiently different from the kinds of instruction typically received that they perceive themselves to be in an experimental situation and therefore work harder and find the course more intellectually and personally stimulating.

Similarly the "Hawthorne Effect" may have held to some degree for faculty. Having invested substantial amounts of time and effort in the instructional development process, the faculty members involved may have quite naturally developed strong personal and professional needs to see the enterprise succeed. The ways in which this might positively influence the quality of the individual faculty members's own teaching are not precisely known. However, the fact that the instructional development process frequently involves faculty with an intensive analysis of the assumptions they hold about the structure of teaching and learning might conceivably reinforce an increased sensitivity to the quality and effectiveness of their own in-class teaching behaviors. Thus, one outcome of the substantial time and effort spent by faculty in the systematic design of instruction may be a greater concern for their own effectiveness in the classroom, particularly in that course where they have so much invested professionally.

Related to this consideration is the possibility of a self-selection process in terms of the characteristics of those faculty having a high

interest in systematically developing non-traditional instruction. As a group, such faculty may have not only a genuine concern for the quality of their teaching, but may also, partially as a result of this concern, represent some of the institution's most effective and provocative teachers. Thus in the present study the systematic design group may have responded more favorably to the academic program than their classmates in the conventional group, not so much because of the particular instructional design of the courses in which they were enrolled, but rather because their enrollment in these specific courses involved a greater probability of exposure to individually good teachers.

Perhaps the most valid explanation is one which posits the potential interaction between course instructional design and effective teaching. Work with an on-campus agency to design courses systematically may tend not only to draw faculty who are good teachers to begin with, but also provide these individuals with the facilities and resources necessary to take optimum advantage of their particular pedagogical talents. It seems entirely possible that students in these courses may be responding to an instructional gestalt in which the course design and instructional format amplify the faculty member's most effective teaching behaviors.

Beyond differences in faculty characteristics, however, the observed differences in the findings might also be the result of significant variations in student characteristics. Although the systematic design and conventional student groups appear quite homogeneous in terms of such variables as sex distribution, expected major, orientation toward college, educational goals and academic aptitude the fact that students by and large "self-selected" themselves into these groups rather than being randomly assigned makes it at least possible that other variables such as the students' cognitive style may have accounted for a significant portion of the observed sample differences. Research by Gaff (1970) and Morstain (1974) has indicated that students preferring experimental or independently designed academic experiences tend to differ from their classmates in personality characteristics and educational attitudes and orientations. While the results of the present study differ somewhat from the findings

of Gaff and Morstain, quite possibly unmeasured personal orientations or cognitive styles which lead certain students to be attracted to the non-traditional features of systematically designed courses may also tend to make them more open, responsive and favorably disposed to the instruction received in all their courses.

The study is limited in the degree to which the relationship between attitudes toward instruction and actual student behaviors is left unexplained. How closely the observed, statistically significant differences between the sample groups in this study can be related to observable variance in such student behaviors as academic achievement, expressed satisfaction with college, and attrition is not clearly or reliably substantiated. Despite this limitation, however, evidence does exist to suggest that the attitudes toward instruction developed during the freshman year are critical in providing a foundation for the student's subsequent openness to the impacts of college (e.g., Wallace, 1966; Katz and associates, 1968). Indeed, as suggested by Kauffman and associates (1968, pp. 11-12):

> the freshman experience is . . . critical to the college and the student. It is a time when the student's critical attitudes toward his studies and college in general is formed, when the college must demonstrate the relevancy of liberal learning to a ready-to-believe but not-yet-convinced student audience.

Thus, while students' ratings of their academic program may not be causally related to a number of readily observable student behaviors, their real significance may be in the groundwork they lay for future college impacts.

The linkage which the study tentatively identifies between course design and students' broader perceptions of their academic program has several clear and significant implications both for the area of instructional development and for research on the impact of college on students. The results suggest that systematically designed courses do make a difference; however, ferreting-out the most significant elements in such courses may require investigation of a more experimental nature. Indeed, as suggested by Campbell and Stanley (1963), one implicit purpose of this ex post facto and essentially correlational study was to explore whether such subsequent experimental investigation might be warranted.

The nature and extent of the interaction between the instructional development process and teacher performance needs to be more clearly delineated. If the instructional development process makes a difference, to whom does it matter? Are the differential results obtained from student groups attributable more to restructured course content? to varied instructional delivery systems? to enhanced faculty performance? or, as seems more likely, interaction among these variables? Does the instructional development process benefit students directly? Or are the benefits students derive mediated through the involvement of faculty members in the course development process, student benefits being, therefore, of a second and different order?

The movement from evaluation of single courses to assessment of the cumulative effects of systematic course design on attitudes toward the total academic program will require careful definition of what constitutes "an academic program," as well as to the delineation of the characteristics of such programs. What are the differences between a "curriculum" and an "academic program"? Overall, the seven systematically designed courses used for grouping purposes in this study stressed, to varying degrees, the following elements: 1) self-pacing; 2) flexible credit; 3) an increased number of content options (when compared with more conventional courses); 4) a variety of teaching strategies; 5) use of self-instructional materials; 6) interdisciplinary content and 7) a considerable amount of built-in formative evaluation. Which (if any) of these elements can be associated with the differential student perceptions of their academic program? What are the relative contributions of each?

In many respects, this study is exploratory at best. It raises at least as many questions as it answers. But it also tentatively establishes a link between freshman students' exposure to systematically designed courses and more positive attitudes toward their academic program.

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